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THE ROLE OF NEURAL REFLEXES IN CONTROL OF THE  
CARDIOVASCULAR SYSTEM DURIN. (U) TEXAS UNIV HEALTH  
SCIENCE CENTER AT SAN ANTONIO DEPT OF PHARM.

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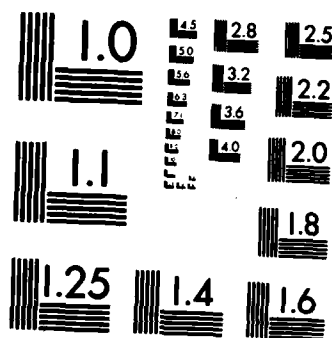
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| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br>The inhibitory influence of vagal afferents on the cardiovascular systems was determined in studies with anesthetized cats and conscious dogs. Results indicate that vagal afferents exert a tonic influence on vasopressin release in conscious dogs. It was also found that these afferents may play a keen role in the regulation of renin secretory rate during conditions which may alter cardiopulmonary blood volume. A number of studies illustrated the importance of cardiac vagal receptors in the regulation of vascular resistance and the inotropic state of the heart. Data also indicated that |                                      |   |

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cardiac vagal receptors may serve as part of a negative feedback system to regulate sympathetic outflow to the heart.

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**AFOSR-TR. 84-0398**

**FINAL SCIENTIFIC REPORT  
AFOSR-78-3657  
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**THE ROLE OF NEURAL REFLEXES IN CONTROL OF THE  
CARDIOVASCULAR SYSTEM DURING STRESS**

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**Controlling Office: Air Force Office of Scientific Research/NL  
Bolling AFB, DC 20332**

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Grant AFOSR 78-3567  
"The Role of Neural Reflexes in Control of the  
Cardiovascular System During Stress"

Final Progress Report

Objectives

During the past year, we have determined the inhibitory influence of vagal afferents on the cardiovascular system. This involved studies in anesthetized cats and conscious dogs. The following is a brief summary of our accomplishments during the last year.

Vagal Afferents Exert a Tonic Influence Vasopressin Release in the Conscious Dog

Recent studies have implicated vasopressin as an important hormone in the regulation of arterial pressure. However, the role of the nervous system in controlling the release of vasopressin has not been determined. We showed that in the conscious hydrated dog afferents in the vagus nerve exert a tonic inhibitory influence on the release of plasma vasopressin. In the resting conscious dog the plasma concentration of plasma vasopressin averages 2.86  $\mu\text{U/ml}$ . Interruption of vagal afferents by vagal cold block increases the concentration 2.5-fold, suggesting that vagal afferents activity contribute to the maintenance of a low level of circulating vasopressin. In the absence of arterial baroreflexes interruption vagal afferents increases the plasma vasopressin concentration from 3.4  $\mu\text{U/ml}$  to 32  $\mu\text{U/ml}$ . These data imply that when the input from the arterial baroreceptors is low such as in hypotension vagal afferents play an important role in controlling plasma vasopressin. During stresses which lower arterial pressure and decrease venous return plasma vasopressin would increase as a result of a reduction in inhibitory activity from cardiopulmonary receptors and arterial baroreceptors.

Effects of Vagal Cold Block on Plasma Renin Activity and Renin Secretion in the Conscious Dog With Normal and Elevated Renin Secretion

In the conscious dog, we determined the effects of vagal afferents on plasma renin activity under condition of low renin activity and when renin activity was elevated (low Na intake). Interruption of vagal afferents by vagal cold block increase arterial pressure but did not alter plasma renin activity or renin secretory rate in dogs with normal or high sodium diet. However, when renal perfusion pressure was maintained at normal levels (prevented from increasing during vagal cold block) vagal cold block resulted in a significant increase in plasma renin secretory rate of  $486 \pm 157$  ng/min and  $1167 \pm 466$  ng in dogs with normal and high initial secretory rates, respectively. Thus vagal afferents may play a keen role in the regulation of renin secretory rate during conditions, which may alter cardiopulmonary blood volume.

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MATTHEW J. KENNEDY  
Chief, Technical Information Division

### Effects of Veratridine on Plasma Catecholamine Concentrations in the Sinoaortic Denervated Cat

Activation of cardiac vagal afferents with veratridine produced a significant decrease in plasma norepinephrine (-20%) and epinephrine (-28%). Interruption of vagal afferent activity alone resulted in an increase in norepinephrine (48%) and epinephrine (82%). Administration of veratridine during vagal cold block increased norepinephrine (98%) and epinephrine (126%). Thus activation of cardiac receptors with veratridine initiates a reflex fall in plasma catecholamines. The increase in catecholamines when the afferent activity is blocked is probably due to veratridin direct effect on the adrenal medulla. In summary it appears that cardiac receptors subserved by vagal afferents exert an inhibitory influence on plasma catecholamines. This inhibitory influence can be increased when the receptors are activated. During stresses which alter central blood volume these cardiac receptors may modulate the sympatho-adrenal responses.

### Reflex Cardiovascular Changes with Veratridine in the Conscious Dog

This study was undertaken to examine the reflex responses of activation of cardiac sensory receptors in the conscious dog. Intra-coronary injections of veratridine elicited a reflex decrease in arterial pressure, heart rate and left ventricular dP/dt. Bilateral vagal cold block eliminated the depressor and bradycardia responses to veratridine. Bilateral vagal cold block not only eliminated the negative inotropic response but reverse it to a positive response. Veratridine also decreased renal blood flow but did not alter renal resistance. In contrast iliac blood flow was increased with veratridine resulting in a decrease in skeletal muscle resistance. Vagal cold block prevented the changes in renal and iliac flow or resistance to veratridine. These studies serve to illustrate the importance of cardiac receptors in the control of the circulation. Thus increase in decreases in the activity of these receptors due to various stresses could decrease or increase vascular resistance of the skeletal muscle and inotropic state of the heart.

In addition to the above studies which illustrate the importance of the cardiac vagal receptors in regulation of vascular resistance, inotropic state of the heart and the neurohumoral drive to the circulation we have also shown that these cardiac vagal receptors may serve as part of a negative feedback system to regulate sympathetic outflow to the heart (Circ. Res. 49:159, 1981).

### Abstracts

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Heesch, C.M. and V.S. Bishop. Interaction between the carotid sinus and cardiopulmonary reflexes in the modulation of plasma catecholamine concentrations in the anesthetized cat. Circ. Res. (Submitted), 1983.

Undesser, K.P., M.P. Lynn and V.S. Bishop. Rapid resetting of aortic nerves in conscious rabbits. Am. J. Physiol. (In Press).



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